us. Department
of Transportation
Federal Aviation Administration

Advisory Circular

Subject: LANDING GEAR DOORS AND RETRACTION MECHANISM

Date: March 26, 1984 **AC No:** 23.729-1
Initiated by: ACE-100 **Change:**

1. PURPOSE. This advisory circular provides information and guidance concerning acceptable means, but not the only means, of compliance with Part 23 of the Federal Aviation Regulations (FAR) applicable to the structural substantiation to the loads resulting only from all yawing conditions for the landing gear doors and retraction mechanism of small airplanes.

2. RELATED FAR SECTION. Section 23.729(a)(2).

3. BACKGROUND. Section 23.729(a)(2) requires the landing gear doors and retraction mechanism to be substantiated for the loads resulting from all yawing conditions. Attempts have been made to meet these requirements by flight testing to V_D with some yaw or by flight testing at full yaw at a lower speed. These procedures normally do not result in a test that substantiates a 1.5 factor of safety. If substantiation by flight testing is desired, the landing gear doors and retraction mechanism must be subjected to 1.5 times the limit "q" loading. The limit "q" loading is the "q" at V_{LE} or V_{LO}, whichever is greater.

The higher of the above speeds at which V_q is to be computed is designated as V_{LG}.

4. APPLICATION. This guidance material is applicable for new, amended and supplemental type certificates and alterations that affect the landing gear doors and retraction mechanism of small airplanes whose certification basis includes Section 23.729(a)(2), Amendment 23-7, or later.

5. ACCEPTABLE MEANS OF COMPLIANCE. One method, but not the only method, for showing compliance with the structural requirements of Section 23.729(a)(2) for the loads resulting from all yawing conditions for the landing gear doors and retraction mechanism is as follows:

a. Substantiation may be accomplished by flight testing at a speed of V_q and the yaw angle determined in paragraph 5a(3) below, unless this will exceed the structural limitation, as determined by analysis, static test, or a combination of both, where:

(1) $V_q = \sqrt{V_{LG}^2 \times 1.5}$

(2) V_{LG} = The greater of V_{LO} or V_{LE}.

(3) For the yawed condition, the limit "q" load will be at V_{LG} with the airplane at the yaw angle determined by Section 23.441. This angle need not exceed 15°. Substantiation must be to 1.5 "q".

(4) If V_q is equal to or less than $V_{A'}$ substantiation by flight test may be accomplished!

(5) If V_q is greater than $V_{A'}$ the yaw necessary to produce 1.5 "q" could result in overloading other airplane structure, and the maneuver should not be performed.

(6) V_{LG} may be reduced by imposing limitations on the airplane such that V_q is less than V_A.

(7) The definitions of the terms used above are equivalent airspeeds as follows:

(i) V_A = Design maneuvering speed.

(ii) V_D = Design diving speed.

(iii) V_{LG} = Landing gear speed used in the calculation of V_q.

(iv) V_{LE} = Maximum landing gear extended speed.

(v) V_{LO} = Maximum landing gear operating speed.

(vi) V_q = Speed which results in 1.5 times limit "q" loading.

b. If the condition of paragraph 5a(5) above exists, substantiation of the landing gear doors and retraction mechanism may be accomplished by static tests, analyses, or a combination of both.

MURRAY E. SMITH
Director, Central Region